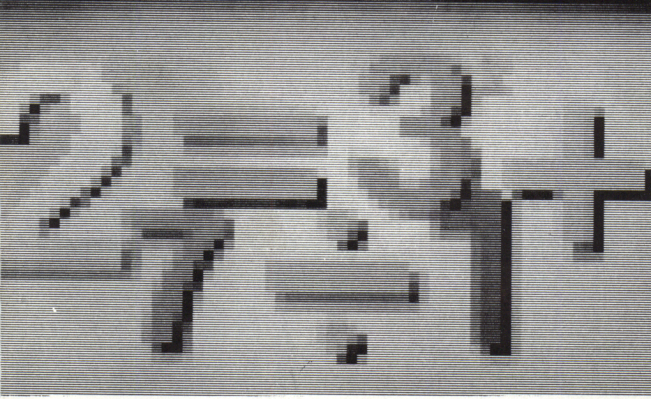
SUCCESS WITH MATH™

Fractions: Multiplication and Division

User's Manual



CBS SOFTWARE

Setting up your Computer

Following manufacturer's instructions, hook up your computer to a monitor or TV. Make sure your disk drive or program recorder is connected.

For Disk:

1. Insert the program disk into the disk drive and close the drive door.
2. Turn your computer and monitor on. Adjust the volume on your monitor.
3. a. Apple® and Atari® disk drives will automatically boot disks.
   b. Commodore 64™ users type **LOAD "CBS MATH",8** and press [**RETURN**]. Then type **RUN** and press [**RETURN**] again.

For Cassette:

1. Insert the program cassette into the program recorder following cassette label instructions.
2. Turn computer and monitor on. Adjust the volume on your monitor.

Atari® Users

3. Make sure BASIC cartridge is in computer.
4. Type **CLOAD** to load the program and push down PLAY button on your program recorder. Press [**RETURN**].
5. Once program has loaded, type **RUN** and press [**RETURN**].

Commodore 64™ Users

3. Type **LOAD** and press [**RETURN**].
4. *New Models Only—*
Wait for program to be found and press [C=].
5. After program has loaded, "Ready" will appear on screen. Type **RUN** and press [**RETURN**].

Program written and developed by Don Ross.
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Program Objective

This SUCCESS WITH MATH™ program provides comprehensive practice in multiplication and division of fractions. Further emphasis is placed on improving the user's understanding of the cancellation and reduction processes used to simplify problems.

Program Descriptions

Multiplying Fractions
All problems are generated randomly so that new problems are presented each time the program is run.

The screen is divided into three sections: original problem, work area and message/instruction area. When each new problem is presented, the message/instruction area lists two options. For example:

ORIGINAL PROBLEM

$$\frac{4}{12} \times \frac{8}{7}$$

WORK AREA

$$\frac{4}{12} \times \frac{8}{7}$$

Choose one (or S to stop)

1) Cancel or reduce
2) Multiply

If, as in our example, there are opportunities to simplify the problem by cancellation or reduction, the user must first choose option 1 and enter the numbers to be cancelled.

First number *User enters 12*
Second number *User enters 8*

These numbers are then highlighted in the work area. Note that the user also had the option of selecting 4 and 12 as the numbers to be cancelled.

The solving procedure continues with the user entering new values for the cancelled numbers. This is done by finding the Greatest Common Factor (GCF) of the two numbers (which is in this case 4) and dividing each one by that value.

Enter replacement for 12 *User enters 3*
Enter replacement for 8 *User enters 2*

The Greatest Common Factor of two numbers can be found as follows:

1) List the prime factors of the first number.
   (12 = 2x2x3)
2) List the prime factors of the second number.
   (8 = 2x2x2)
3) List all the factors that are in both numbers and multiply them to obtain the GCF.
   (GCF = 2x2 = 4)

If the user is unable to correctly determine the GCF of the two numbers he/she has selected to cancel, the program provides an explanation of the correct GCF and the new values to be entered. The user must then re-enter the original numbers and then enter their new values. The user's work area would then look like this:

WORK AREA

$$\frac{4}{3} \times \frac{2}{7}$$

Choose one (or S to stop)

1) Cancel or reduce
2) Multiply

Since there are no more numbers that can be cancelled or reduced, the user may select option 2. The product of the numerators is entered first, followed by the product of the denominators.

WORK AREA

$$\frac{4}{3} \times \frac{2}{7} = \frac{8}{21}$$

That is correct.

If the numerator of the product is greater than its denominator, the program branches into a section where the user must convert the fraction to a mixed fraction.

Dividing Fractions
All problems are generated randomly so that new problems are presented each time the program is run.

The screen is divided into three sections: original problem, work area and message/instruction area. When each new problem is presented, the message/instruction area lists three options. For example:

ORIGINAL PROBLEM

$$\frac{4}{12} \div \frac{5}{6}$$

WORK AREA

$$\frac{4}{12} \div \frac{5}{6}$$

Choose one (or S to stop)

1) Reciprocate divisor
2) Cancel or reduce
3) Multiply

The rules of dividing fractions state that in order to obtain a quotient, the dividend (the first term) must be *multiplied* by the reciprocal, or the inverse, of the divisor (the second term). Therefore, the user may first choose option 1 and enter the numerator of the reciprocal fraction (6 in our example) followed by the denominator of the reciprocal fraction (5 in our example) so that our division problem is changed into a multiplication problem.

ORIGINAL PROBLEM

$$\frac{4}{12} \div \frac{5}{6}$$

WORK AREA

$$\frac{4}{12} \times \frac{6}{5} = -$$

Choose one (or S to stop)

1) Reciprocate divisor
2) Cancel or reduce
3) Multiply

The rules governing the multiplication of fractions now apply. If, as in our example, there are opportunities to simplify the problem, the user must choose option 2 and enter the numbers to be cancelled.

The rules of dividing fractions state that in order to obtain a quotient, the dividend (the first term) must be *multiplied* by the reciprocal, or the inverse, of the divisor (the second term). Therefore, the user may first choose option 1 and enter the numerator of the reciprocal fraction (6 in our example) followed by the denominator of the reciprocal fraction (5 in our example) so that our division problem is changed into a multiplication problem.

ORIGINAL PROBLEM

$$\frac{4}{12} \div \frac{5}{6}$$

WORK AREA

$$\frac{4}{12} \times \frac{6}{5} = -$$

Choose one (or S to stop)

1) Reciprocate divisor
2) Cancel or reduce
3) Multiply

The rules governing the multiplication of fractions now apply. If, as in our example, there are opportunities to simplify the problem, the user must choose option 2 and enter the numbers to be cancelled.

First number *User enters 12*
Second number *User enters 6*

These numbers are then highlighted in the work area. Note that the user also had the option of selecting 4 and 12 as the numbers to be reduced or cancelled.

The solving procedure continues with the user entering the new values for the cancelled numbers. This is done by finding the Greatest Common Factor (GCF) of the numbers in question (which is in this case 6) and dividing each term by that value.

Enter replacement for 12 *User enters 2*
Enter replacement for 6 *User enters 1*

If the user is unable to correctly determine the GCF of the two numbers he/she has selected to cancel or reduce, the program will provide an explanation of the correct GCF and the new values to be entered. The user may then re-enter the original numbers and then enter their new values. The user's work area would then look like this:

WORK AREA

$$\frac{4}{2} \times \frac{1}{5}$$

Further cancellation and reduction can take place with the numbers 4 and 2, so the user may again choose option 2 and carry out the correct procedure until the problem appears as follows:

WORK AREA

$$\frac{2}{1} \times \frac{1}{5}$$

Now the user can choose option 3 since there are no more numbers that can be cancelled or reduced. The product of the numerators is entered first, followed by the product of the denominators.

ORIGINAL PROBLEM:

$$\frac{4}{12} \div \frac{5}{6}$$

WORK AREA

$$\frac{2}{1} \times \frac{1}{5} = \frac{2}{5}$$

That is correct.

If the numerator of the product is greater than its denominator, the program will branch into a section where the user may convert the fraction to a mixed fraction.

In both Multiplication and Division, all errors are called out and explained as they occur and the user may then try a new answer. Errors are divided into two categories: procedural and computational. Procedural errors involve the incorrect use of a rule. Computational errors involve a mistake in calculation. The program tracks type and number of errors made and displays the totals on the screen after the solution is reached.

It is important to note that the user must enter the correct answer for each step before the program will continue on to the next step in the solving process. *The user always succeeds in solving the problem and knows exactly where errors have been made.*

Other programs in the Success With Math™ series from CBS Software:

Addition and Subtraction—Grade Levels 1 to 4

Multiplication and Division—Grade Levels 2 to 8

Fractions: Addition and Subtraction—Grade Levels 5 to 8

Decimals: Addition and Subtraction—Grade Levels 5 to 8

Decimals: Multiplication and Division—Grade Levels 5 to 8

Linear Equations—Grade Levels 7 to 11

Quadratic Equations—Grade Levels 9 to 12

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